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Microwave Tissue Coagulation for the Treatment of Advanced Inoperable Sarcoma

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Summary

A 39-year-old woman was operated on and given a diagnosis of parosteal osteosarcoma at Okayama University Hospital. Subsequently, she had recurrencies and underwent surgical treatment repeatedly. After it was established that the tumor was inoperable, radiation therapy was initiated, but this turned out to be ineffective. Since then, she visited Tottori University Hospital to receive totalbody hyperthermia for the treatment of the advanced malignancy. Although this treatment brought about a transient remission of symptoms, the tumor was still growing. At the age of 48 years, she was introduced to Wakayama Medical College Hospital for microwave coagulation therapy. It was useful for tumor reduction and hemostasis against tumor bleeding. In addition, the nonspecific immunity of the patient was enhanced. This therapy may work as a so-called "Biological Response Modifier".

Introduction

We need effective multimodal therapy to overcome the difficulties in the management of patients with malignant neoplasms. Advanced carcinomas are also difficult to treat and there are

Key words: Microwave tissue coagulation, Biological response modifier.
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still controversies about their treatment. We experienced a case of sarcoma which could survive many years, during which time various treatments such as operation, radiation, totalbody hyperthermia, and microwave coagulation were tried at three different institutes. In Wakayama Medical College Hospital, this case was subjected to microwave coagulation therapy using the microwave tissue coagulator devised by TABUSE[6,7], we had an impression that this technique is of some value.

Case Report

A 48-year-old woman was introduced to the Department of Gastroenterological Surgery, Wakayama Medical College with the diagnosis of inoperable parosteal osteosarcoma in September, 1981. She had a long medical history relating to the disease. The onset of lumbago can be dated back to December, 1972 when she was 39 years old. She noticed a mass on the left buttock in

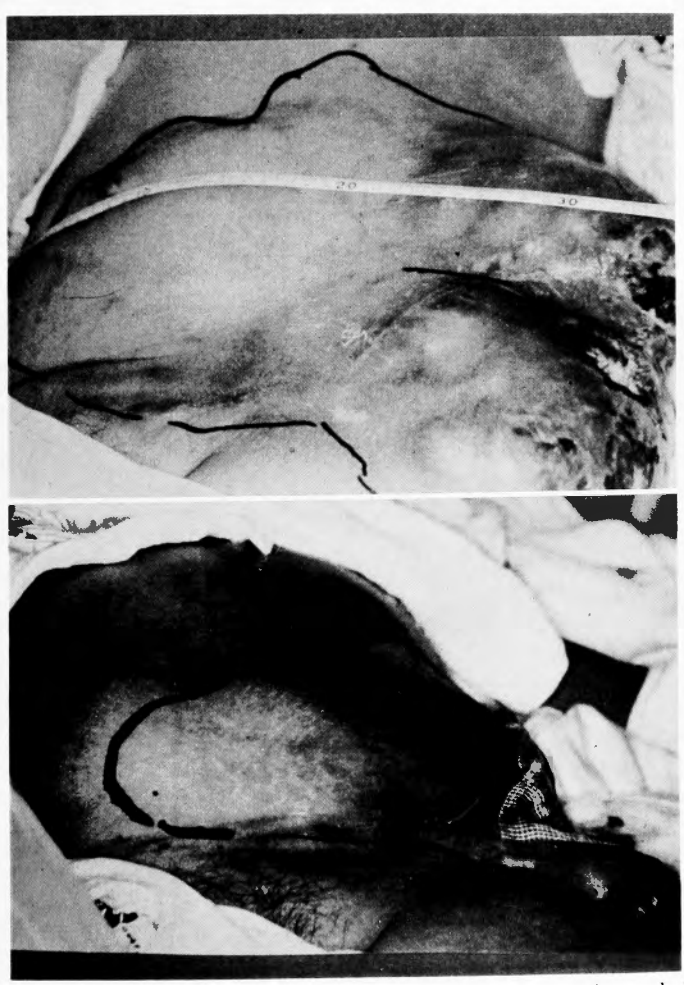

Fig. 1. The upper picture shows the size of the tumor on admission and the lower one that after microwave coagulation therapy.

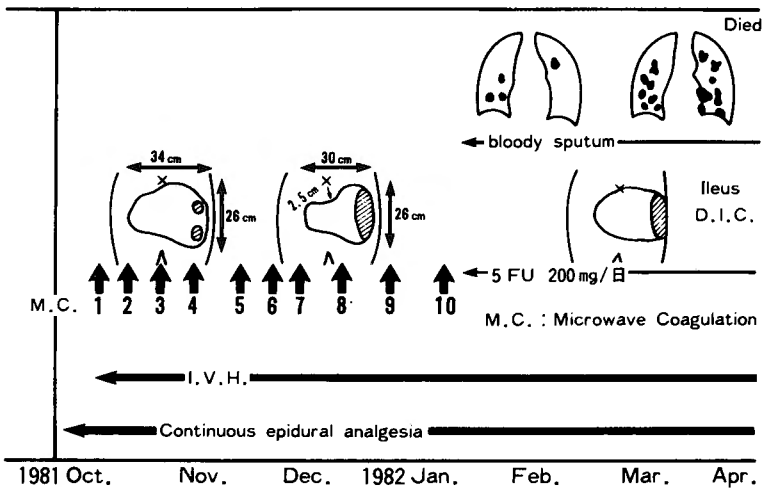

Fig. 2. Clinical course in Wakayama Medical College Hospital

May, 1973. A biopsy revealed the histological features characteristic of desmoid. She received radiation therapy (40×200 rad ^{60}Co) at a local hospital. In order to consult about chemotherapy, she visited Okayama University Hospital. However, total resection of the tumor was done there in November, 1973 on the basis of the same diagnosis as above. The diagnosis of parosteal osteosarcoma was established by examination of operative specimens. The tumor recurred in 1975,

Fig. 3. The procedure of microwave coagulation. The tumor is coagulated by inserting the monopolar antena.

1976, and 1978 and operative surgery was performed each time. In October, 1979, her case was diagnosed as being inoperable. After radiation therapy without benefit, she was referred to Tottori University Hospital for totalbody hyperthermia[2,3] in January, 1981. Her rectal temperature was kept at 41.5 to 42°C for 3 to 5 hours and 30 mg of Adriamycin was administered. Four times of this therapy alleviated the symptoms to some extent without side action. Computed tomography showed a local ulceration of the tumor with a slight reduction in tumor size.

In September, 1981, she was introduced to Wakayama Medical College Hospital on account of the tumor growth and the increased pain. Physical examination disclosed anemia, a huge tomor occupying the left lower quadrant abdomen as shown in Figure 1, and a swelling of the left lower extremity. Her clinical course followed up in that hospital is illustrated in Figure 2. Microwave tissue coagulation was done 10 times during a 3-month period. Intravenous hyperalimentation and continuous epidural analgesia were carried out for the management of her conditions during this therapy. The monopolar antenna connected to the microwave tissue coagulator, which was devised by Tabuse, was inserted into the tumor as shown in Figure 3. This was repeated 15 to 20 times in one procedure where irradiation of microwaves generated by the electric output of 65 watts was performed for 3 minutes. During this therapy, she was in good condition and the tumor was decreased in size with a relief of symptoms (Fig. 1). Immunological parameters were checked with the results displayed in Figure 4. The number of lymphocytes was increased. Lymphocyte transformation in response to either phytohemagglutinin or concanavalin A was enhanced. The number of IgG-FcR$^+$T cells was increased. And, interferon was also increased. She sometimes had a fever up to 39°C as a side action of this therapy and corticosteroid was administered. She began to cough with bloody sputum in January, 1982 and chest x-ray films showed metastatic nodules up to 2 cm in diameter in bilateral lung fields. Her general conditions were deteriorated. Suffering from ileus, she died of disseminated intravascular coagulation on

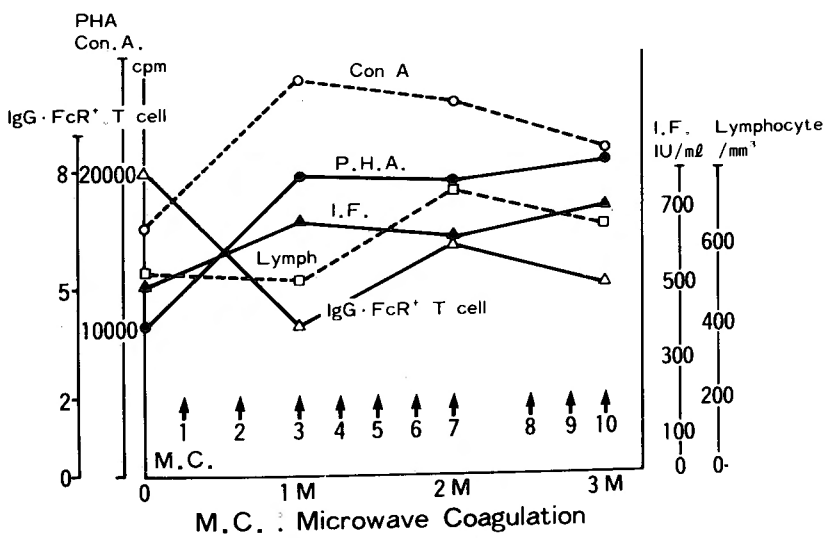

Fig. 4. Immunological parameters

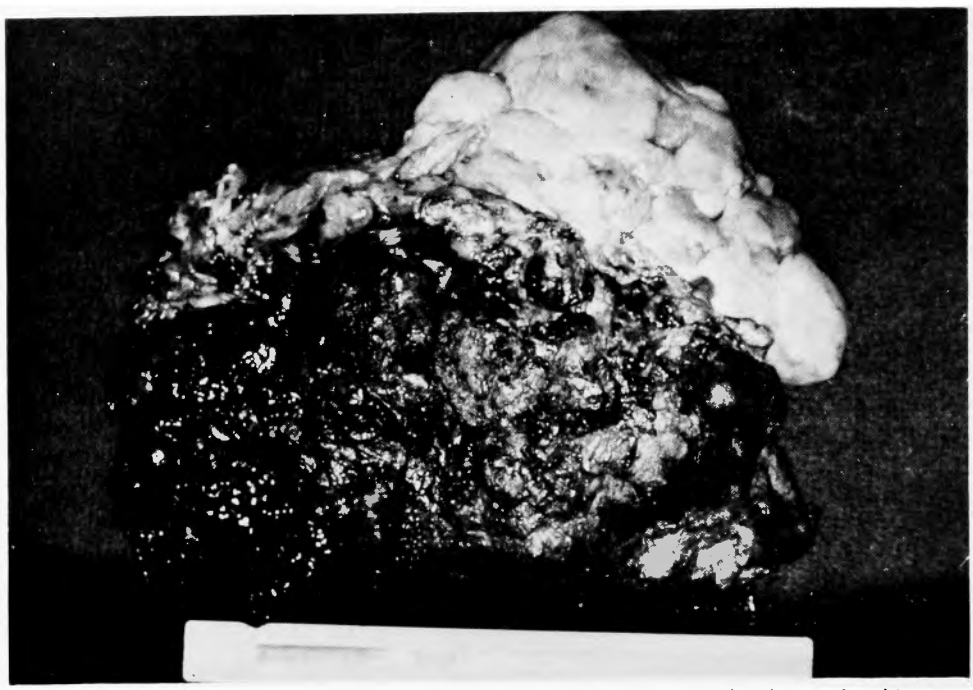

Fig. 5. A tumor weighing 5180 g at autopsy. The outer surface of it facing the skin is almost necrotic.

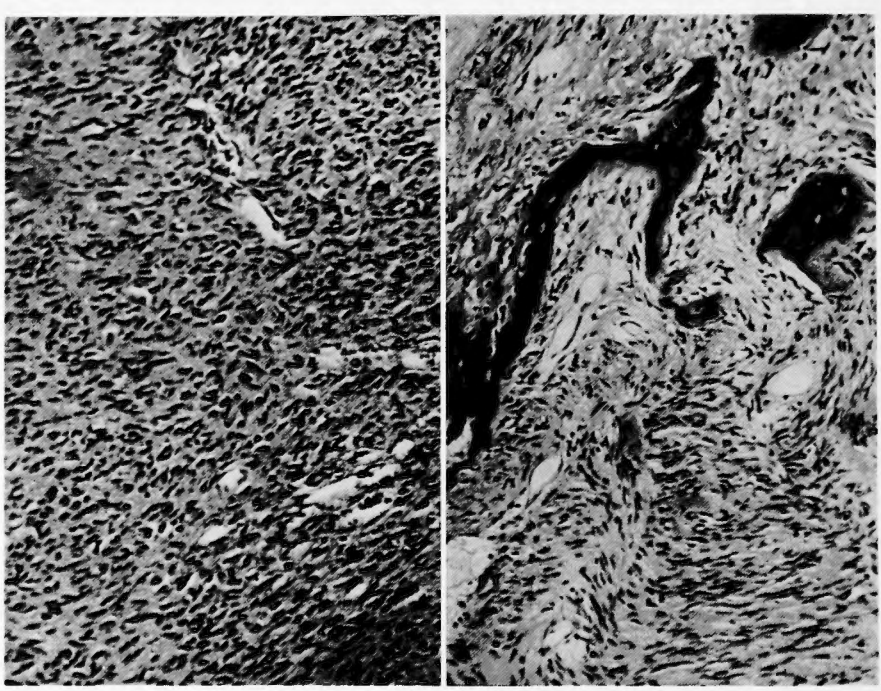

Fig. 6 The tumor is basically composed of atypical spindle cells (left) and primitive bones are formed here and there (right). Hematoxylin-eosin stain

April 2, 1982.

Autopsy was performed. The tumor, sized about 28 by 26 by 24 cm and weighing 5,180 g, occupied a large space of the left lower quadrant and had partial fibrous adhesions to the small and large intestines. It had a hard connection with the left iliac bone. Its outer surface facing the skin was necrotic and bleeding partially (Fig. 5). Histologic examination demonstrated that the tumor was basically composed of atypical spindle-cells (Fig. 6). It formed islands of irregular homogeneous pink ground substance, which were observed as primitive bones here and there (Fig. 6). It was confirmed histologically that the tumor was parosteal osteosarcoma as diagnosed at Okayama University Hospital. The other pathological findings were metastasis to both lungs, fatty changes of the liver and adrenal gland, and hypoplasty of the bone marrow.

Comments

This case was a long survival case of parosteal osteosarcoma. In fact, the patient could survive 9 years and a half since the onset of the disease. Various treatments such as operation, radiation, totalbody hyperthermia, and microwave tissue coagulation, were carried out. It is difficult to ascertain whether they or any of them was effective against this sarcoma, but it is thought to be of vital importance to continue efforts as made in the present case without giving them up. Parosteal osteosarcoma usually can be distinguished from ordinary osteosarcoma because it originates in the parosteal tissue and generally has a better prognosis[4]. The five-year survival rate is reportedly 100 per cent in parosteal osteosarcoma if proper remedial measures are taken. However, recent reports tell us that histologically malignant parosteal osteosarcoma should be treated in the same way as ordinary sarcoma[5]. Anyway, it is essential to get an accurate histological diagnosis. There was an opinion that the present case was fibrosarcoma[8]. The controversial point was whether the bone formation was due to osteogenesis or reactive action. We are of opinion that the diagnosis and operative findings at Okayama University must be observed. In the case in question, the bone formation was suggestive of an osteogenesis of the tumor. Figure 7 depicts the full course of tumor growth and the treatments performed. The horizontal axis shows the approximate volume of the mass (calculated as an hemiellipsoid by three dimensional measurements: length (l), width (w), and height (h), $V=\frac{4}{3}\pi\cdot\frac{1}{2}l\cdot\frac{1}{2}w\cdot h\times\frac{1}{2}=0.5236\ lwh$)[1] and the vertical axis the time course. Each curve drawn between two points represents the tumor growth, and is exponential. We can say that the tumor was kept under control by surgical interventions till 1979. Hindquarter amputation was not done in this case, considering the low development of the tumor and the lowered vital functions. After the diagnosis of inoperable sarcoma was established in October, 1980, the rate of tumor growth seemed to be increased. At the state where the tumor assumed the aspect of advanced malignant neoplasm, totalbody hyperthermia and microwave coagulation were carried out. The former therapy allayed clinical symptoms and brought about a slight reduction in tumor size. In the latter therapy, we used the technique invented by Tabuse. In this technique, a coagulation layer of 10 mm in thickness is provided and hemostasis can be attained against bleeding from vessels not exceeding 3 mm in diameter. The tissue necrotized by coagulation is gradually replaced by connective tissue.

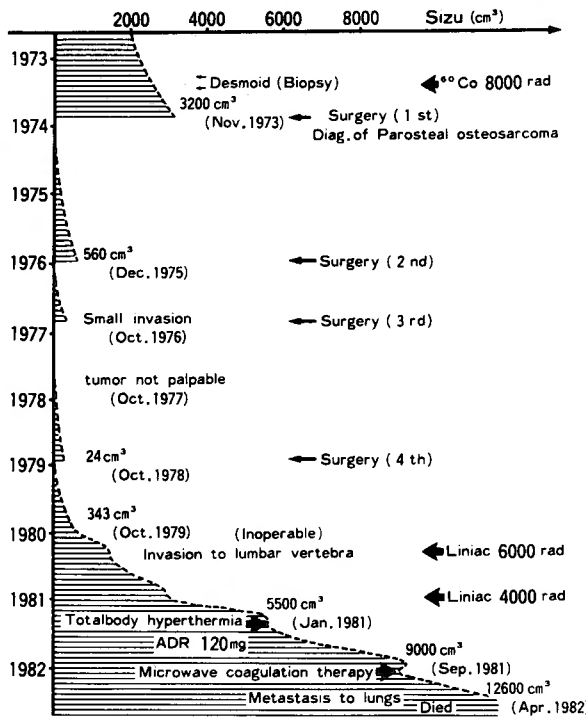

Fig. 7. Tumor growth and treatments

It may well be recommended as quite a useful means of bloodless resection of the parenchymal organs. This technique has been utilized for hepatectomy with safety and its utility has now been expanded to endoscopic tumor reduction and hemostasis against tumor bleeding. The present case of inoperable sarcoma was subjected to microwave tissue coagulation mainly for tumor reduction and immunity enhancement. Consequently, the tumor was reduced in size nonspecific immunity was strengthened during this therapy as expected, aside from the remission of symptoms. This technique may play the role of a socalled "Biological Response Modifier (BRM)".

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和文抄録

手術不能末期肉腫に対するマイクロ波組織凝固法

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前　田　迪　郎

今回私たちは，手術，放射線療法，全身温熱療法と多方面からの治療を受けたにもかかわらず，増大した手術不能（旁骨性）骨肉腫に対して田伏が開発した Microwave coagulator を応用した．本法は Tumor Reduction, Hemostasis として効果があり，かつ今回，非特異的にではあるが免疫能の増強が示された．現在，本法は，肝切除ならびに内視鏡的凝固にも応用されているが，本症例に示された如く，宿主の腫瘍細胞に対する応答を変化させる Biological Response Modifiers (BRM) としての目的をもった方法として期待される．